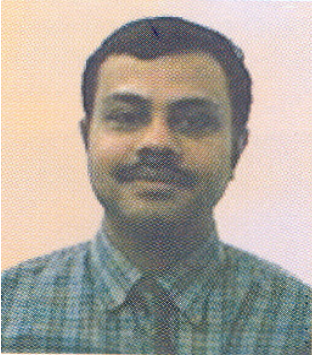


## . HIBERNATION MYOCARDIUM



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### **Definition of Hibernation**

Hibernation was coined in 1989 by Rahim Toola. He noted that left ventricular function improved in some patients with surgery<sup>2</sup>. He described a remarkable patient who has single vessel disease with an occluded left anterior descending artery and anterior akinesis on the contrast left ventriculograms, with a global ejection fraction of 37%. After administration of glycerol trinitrate anterior wall function was seen to improve on the basis of this the patient had bypass surgery. Reinvestigation 8 months later showed normal contraction of the anterior wall and an ejection fraction of 76%.

### **Clinical Occurrence**

Clinical requirement for hibernation occurs in 10%-20% of patients referred for coronary Angiography<sup>3</sup>, and this is from an estimate of the number with severe ventricular dysfunction in whom neither severe dilatation nor cardiomyopathy is present. By contrast another way of looking at hibernation is simply to determine the frequency of improvement in ejection fraction with bypass surgery.

### **Clinical Importance**

It is well known that getting ventricular function is closely related to prognosis<sup>5</sup> and therefore improvement of poor function for patients would be expected to bring significant prognostic benefits. Data to support this already exist from surgical studies where patients with impaired ventricular function can be shown to do very well with revascularization. It is important to remember that the surgical risk in patients with poor function is high and it is not appropriate to suggest that all such patients undergo operation. The clinical requirement is to

pick out those patient with significant hibernation who would benefit and in whom therefore the risk can be justified.

### **Is Myocardium Hibernation Ischaemic?**

Classically ischaemia represents an imbalance between oxygen delivery and demand. If perfusion falls and the myocardium responds by reduced contraction, matching is reestablished between supply and demand. On restoration of normal perfusion the myocardium increases its contraction. In this sense therefore the myocardium is not ischaemic at rest, although ischaemia might develop with exercise. Histological hibernating myocardium shows accumulation of intracytosolic glycogen and less of contractile proteins. The appearances were compatible with an intermediate state between normal myocardium and infarction.

### **Characteristics of hibernating myocardium**

Characteristics of hibernating myocardium therefore includes:-

- 1) Significant L.V dysfunction at rest.
- 2) Prolonged reduction in resting myocardial perfusion (repetitive stunning).
- 3) Perfusion contraction matching.
- 4) No metabolic evidence of ischaemia (creatinine phosphate, lactate).
- 5) Metabolically active (FDG uptake increased)
- 6) Reduction in contractile proteins when chronic.
- 7) Recrutable Inotropic reserve.
- 8) Recovery of contractile function after revascularisation .

### **Detection of Hibernation**

The American Heart Association has recommended that studies should be performed first with single photon emission tomography (SPECT) with further study by positron emission tomography (PET) only in cases of doubt<sup>6</sup>. The approach to detection of hibernation depends on demonstrating a mismatch between contractile function and the myocardial mass in the same segments. A resting injection with redistribution using Thallium -201 is the best protocol for determining resting perfusion and segmental muscle mass. The clinical issue which is not completely resolved is: How much residual muscle mass is significant? For example if 90% of myocardium is infarcted in a segment worthwhile contractile function will never be returned with revascularisation. Experience has suggested that when thallium

activity reflects a residual muscle mass of less than 50% of normal , then useful contractile function is unlikely to be resorted <sup>7,8,9</sup>. Unlike Thallium -201 which can redistribute over time to overcome this problem, the Tc-99m labelled perfusion agents are fixed and under estimation of residual muscle mass might result. However some centers have found Tc-99m labelled tracers to be equally Effective<sup>10</sup>. It is usual for contractile dysfunction to be determined by Echocardiography or MRI. More recently wall motion and wall thickening have been assessed using gated tomography of Tc-99m labelled perfusion agents.

### **Recovery of contractile function after revascularisation**

In patients with unstable angina ,immediate improvement has been documented in segmental and global ventricular function <sup>11</sup> , where as in patients with poor ventricular function after revascularization , recovery of ventricular function may take months. Therefore, studies of hibernation particularly in patients with poor ventricular function should always include late following assessment of contractile function.

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